

APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC-1998-005

TITLE FIT CHECK PRESSURIZED MODULE ADAPTER FLIGHT SUPPORT EQUIPMENT ON SPACELAB LOGISTICS

PALLET

DOCUMENT NUMBER/TITLE TPS SS - PL - MD003-STR-T118

PREPARED BY G.D. O'NEIL

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REQUIRED APPROVAL

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**NASA SUSPENDED LOAD OPERATION
ANALYSIS/APPROVAL**

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OPERATIONS

Fit check the Pressurized Module Adapter Flight Support Equipment (PMAFSE) on the Spacelab Logistics Pallet (SLP) load beams. The work will be performed in the Space Station Processing Facility (SSPF).

SUPPORTING DOCUMENTS - The associated operational procedure and System Assurance Analysis (SAA) are as follows:

- OMI E5516 Rev. H, Flight Hardware/GSE Cleaning & Handling
- TPS SS-PL-MD003-STR-T118, Fit check PMA FSE on SLP Load Beams
- SAA21CRS1-001, 30 Ton Highbay Bridge Cranes - Space Station Processing Facility (SSPF)

GENERAL DESCRIPTION

Align the Flight support equipment with the SLP load beams attached to the Spacelab pallet. Insert pins through the PMAFSE into the Load beams while the FSE is supported with the crane.

This task is completed in the following TPS steps:

- Sequence 03, steps 001 through 004 and Sequence 04 step 001

During the fit check of the PMAFSE to the load beams, 2 personnel will be required to be under the suspended load for the purpose of installing/removing the pins.

RATIONALE/ANALYSIS - The suspended load tasks comply with the NASA Alternate Safety Standard as follows:

Alternate Standard Requirement #1a

This operation cannot be conducted without placing personnel under the suspended load. The pin installation requires 2 personnel to work directly under the suspended PMAFSE hoisting beam.

Alternate Standard Requirement #1a (cont.)

The hoisting operation at the SSPF has been evaluated for alternate methods to complete the task and it has been determined that there are no design, operational, or procedural means to eliminate personnel exposure to a suspended load.

During the assembly, personnel are required to be under the suspended PMAFSE to perform the pin installation/removal. There is no alternative access to the location that is required for the installation of the attaching hardware. This physical limitation precludes any design, operational, or procedural changes that would eliminate personnel exposure to a suspended load.

Alternate Standard Requirement #1b

The possible use of a secondary support system, to catch the load in the event of a crane failure, was analyzed. It was determined that the use of a secondary support system was not feasible because of the size and location of the PMAFSE in relation to the SLP.

Alternate Standard Requirement #1c

The maximum number of personnel permitted under the suspended load while installing the pins is two.

Alternate Standard Requirement #1d

The installation of pins will be accomplished as quickly and safely as possible to minimize exposure time. It will take 2 personnel a maximum of 15 minutes to install the pins into the PMAFSE.

Alternate Standard Requirement #4

TPS SS-PL-MD003-STR-T118 has been written to permit only the approved personnel under the suspended payload. The TPS is available on site for inspection during the operation.

Alternate Standard Requirement #6

- The suspended load operations addressed in this analysis involve one of the 30 ton SSPF bridge cranes. The cranes are designed, tested, inspected, maintained, and operated in accordance with the NASA Safety Standard for Lifting Devices and Equipment, NSS/GO-1740.9.

Alternate Standard Requirement #6 (cont.)

- The SSPF 30 ton crane hoists are equipped with two magnetic holding brakes, each capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load (30 tons) is verified annually. The cranes are designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components. The 30 ton cranes are load tested annually at 100% of their rated capacities. Detailed preventive maintenance is performed monthly, quarterly, semiannually, and annually on the cranes to ensure proper operation. A detailed inspection of the lifting slings is performed annually. Nondestructive testing of the slings and crane hooks is performed annually.
- The PMAFSE Hoist beam and wire rope slings are designed to meet a 5 to 1 safety factor based on ultimate strength. The safe working load of the beam and slings is 6000 lbs. The weight of the PMAFSE and the associated lifting hardware is 1400 lbs.

Alternate Standard Requirement #7 - An SAA has been completed on the 30 ton bridge cranes in the SSPF. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see supporting documents). No critical single failure points were identified during this analysis.

Alternate Standard Requirement #8 - Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist hooks, hoist beams, hoist cables, hoist rod assemblies, and hoist fittings, and crane functional checks are performed before each operation per NSS/GO-1740.9.

Alternate Standard Requirement #9 - Trained and licensed crane operators shall remain at the hoist controls while personnel are under the load.

Alternate Standard Requirement #10 - Appropriate safety control areas are established before initiating operations. Only the minimum number of people (manloaded in the procedure) will be permitted in this area.

Alternate Standard Requirement #11 - A pretask briefing and a safety walk down of the area are conducted prior to the lift to ensure that all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of any hazards involved. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

Alternate Standard Requirement #12 - The personnel beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not continue until communications are restored.

Alternate Standard Requirement #13 - Personnel working beneath the load shall be in continuous sight of the hoist operator and/or task leader.

APPROVAL: DATE:

for *Joel R. Reynolds* *10/26/98*
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